FAA-E-2679a & AMEND 1
SPECIFICATION CHANGE-1
January 28, 1986

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
SPECIFICATION

COMMON DIGITIZER-2 (CD-2)

This specification change forms a part of FAA-E-2679a, dated June 22, 1982, as modified by Amendment 1, dated May 30, 1985.

Page 5, paragraph 1.2: Add the following immediately after the definition of the term "IACP":

"IAU - Interface Adapter Unit. One of the hardware assemblies that interface the Autek 5810A test set to the CD-2 assemblies that it tests.".

Page 17, paragraph 3.1.2: Delete subparagraph (a) and substitute the following therefor:

"(a) CD-2 Special Test Programs and Hardware (3.6.3.1)".

Page 17, paragraph 3.1.3.2: Add subparagraph "(e) as follows:
"(e) CD-2 Special Test Equipment Hardware Supplement Manual (3.12.2.5)".

Page 17, paragraph 3.1.3.3: Add subparagraph (c) as follows:
"(c) CD-2 Special Test Program Software Manual (3.12.3.3)".

Page 131, paragraph 3.5.2.8.5.2: Change the sentence to read in part "...automatic diagnostic requirements of paragraph 3.6.3.1.1 herein.".

Page 137, paragraph 3.6.3.1: Delete all of the present material under this paragraph heading and substitute the following therefor:

"3.6.3.1 Special Test Programs and Hardware.- Special test programs and hardware shall be provided in accordance with the following subparagraphs for fault diagnosis and verification of the correct operation of 52 assembly types used in the BTE, STE, CIM, MIG, MC and RHI shelf portions of the CD-2 system. These assemblies, which are listed in Table IX, shall be able to be tested using the Autek Model 5810A Automatic Test System. The programs for the automatic test procedures for all testable assemblies shall be developed and delivered in accordance with paragraph 3.8.3 herein and shall meet the performance requirements below.

3.6.3.1.1 Test Programs.- Using the test points provided on the CCAs and other plug-in assemblies, the test set shall be able to test (i.e., verify good or bad) and troubleshoot (i.e., fault isolate) the digital and analog circuitry on the assemblies. This process shall be automatic insofar as is practical. The test comprehensiveness shall be at least 90 percent for CCAs implemented using SSI and MSI integrated circuits. For CCAs that employ LSI devices as well as MSI and SSI devices, the test comprehensiveness shall be at least 85%.

Test comprehensiveness shall mean the ability to detect a stuck at high (SA1) or stuck at low (SA0) condition on any individual I.C. pin within the CCA and then isolate that fault. In addition, all LSI chips on these assemblies, shall be functionally exercised insofar as is practical.

Using the automatic test and appropriate hand-held probes or manual test equipment, it shall be possible to isolate a single failure to a single active device or a small group of active devices (integrated circuits, transistors, diodes, etc.) depending on the construction techniques used in a given tested assembly. For assemblies constructed with all active components mounted in sockets, the average number of active devices in these small isolation groups shall be six or fewer per tested assembly. Specific and written FAA approval is required of each assembly test diagnosis procedure in which the average number of active devices in the isolation groups of a tested unit exceeds six or where the test comprehensiveness is less than the allowable limit. Similar approval is required in the event the number of active devices in any one isolation group exceeds 12. Component removal in the course of troubleshooting is permitted. For assemblies constructed with one or more soldered-in active components, isolation of a fault in one of these soldered-in components shall be to that single active device.

3.6.3.1.2 Test Hardware.- The Interface Adapter Units (IAU) required to connect the CD-2 assemblies to the Autek tester shall conform to one of the following three categories:

a) Autek IAUs (P/N 3829 or 4376)

b) Modified IAU design with Autek P.C. board

c) Modified IAU design.

For the modified IAU categories (b and c), the IAU design must be made form, fit and function equivalent to the Autek IAU. Where a non-Autek P.C. board is used in the IAU design, MIL-STD-275 shall apply except that an Augat class 05 customized board may be utilized at the contractor's option. The IAU frames shall be designed to include a durable structure, protective iridite finish, rounded edges and permanent markings identifying both the IAU and the CCAs that it tests.

The IAUs shall also meet the following design and contruction requirements.

a) Plug-in sockets and wire-wrap connections will be used to the maximum extent practical.

b) Soldered-in devices shall be kept to a minimum.

c) Harness and component identification (reference designations) shall be physically made on the hardware in a permanent manner.

Special attention shall be given during IAU design to human engineering factors so that the IAU setup and test operation are as simple as practical. Each IAU may adapt more than one assembly to the test set. The number of different IAUs shall be kept to the minimum necessary to do the job without making IAU set-up overly complex. It shall be possible for each IAU to be changed from one tested assembly's set up to any other set-up for an assembly tested with that IAU in less than 3 minutes by a technician who is moderately familiar with the testing of these assemblies.

All IAU adjustment and adaptation controls shall be implemented using dipswitches, toggle switches and rotary controls. In the event the complexity of any IAU is such that it is comprised of more than 40 active devices, it shall be able to be tested as if it were a tested CD-2 assembly listed in Table IX herein. Each IAU shall have at least 10 percent of its useable connector pins, cable wires and component mounting area left spare and available for future use by the government.

All power supplies and the interconnecting cables required to connect them and the tested assemblies to the IAUs and/or the Autek tester shall be provided. The power supplies, which may be commercial off-the-shelf supplies, shall be housed in a single assembly for desk top mounting. The assembly and its constituent supplies, cables, connectors, jacks, etc., shall be marked to identify these items. It shall carry a nameplate similar to those on the CD-2 equipment, be constructed of steel or

aluminum and finished as required above for the IAUs. Adequate cooling of the supplies shall be provided. The assembly shall include a circuit breaker and all necessary cables.

A single cabinet for IAU and power supply storage shall be provided for each set of IAUs and power supplies. The cabinet will meet best commercial practices.".

Page 140, paragraph 3.8.1: In line 16, change "microprocessors are used in the CCA test set, program development set" to read "microprocessors are used in the program development set".

Page 140, paragraph 3.8.2: In line 2, change "the CD-2 equipment as specified elsewhere herein." to read "the CD-2 and the input simulator as specified elsewhere herein."

Page 140, paragraph 3.8.2.1.1: In line 3, change "used in the CD-2 and its supporting equipment." to read "used in the CD-2 and the input simulator."

Page 140, paragraph 3.8.2.2: In line 3, change "the CCA test set and the program development set." to read "the program development set.". In line 4, change "these equipments" to "this equipment".

Page 141, paragraph 3.8.3: Delete all of the present material under this paragraph heading and substitute the following therefor:

"3.8.3 Special Test Programs.- The test programs and routines necessary to fully test the CD-2 assemblies listed in Table IX using the Autek 5810A Automatic Test System as required in 3.6.3.1 shall be provided. The programs shall be delivered on floppy discs that are fully operable and compatible with the 5810A and 5800 automatic test systems. The test routines for more than one tested assembly may be contained on one such disc provided, however, that each such routine is complete on that disc. Where appropriate, the contractor may elect to develop and use for testing the CD-2 assemblies, a modified, enhanced version of the 5810A system resident software contained on each program disc. In this event, however, the identical modified software shall be used for all CD-2 test routines and, accordingly, shall be provided on each CD-2 program disc. In no instance shall any such change in the software require software or hardware or other modification of the Autek 5810A system itself. In order to permit the FAA to enhance the effectiveness and maintain the currency of the test routines as the tested assemblies are modified over the life of the CD-2 equipment, the stored programs (including the changed system software, if applicable) shall be able to be altered on small or large scale, or even totally rewritten using the Autek 5800 Automatic Test System programming capabilities.".

Page 162, paragraph 3.12.2.2: Delete the sentence at the bottom of the page, which begins "Separate, "stand-alone" instruction books shall....", and substitute: "When required by the contract a separate, a "stand-alone" instruction book shall be provided which describes the theory of operation, maintenance, and repair of the input simulator.".

Add the following paragraph between the end of 3.12.2.2 and the start of 3.12.2.2.1:

"The contractor shall prepare a supplement to the CD-2 manuscript plan for the Hardware Supplement Manual (3.12.2.5), the CD-2 Supplement for Autek 5810A Operation and Maintenance Manual (3.12.3.1.3), and the Special Test Program Software Manual (3.12.3.3). This manuscript plan supplement shall be prepared using charts, graphs and narratives to describe the contractor's plan for developing and delivering the required documentation for the special test programs and hardware. Typical drawings and text of the proposed manuals shall be included in the plan. The plan shall include a schedule for manuscript preparation, review and validation. The events and submission dates the contractor proposes for assuring that printed instruction books will be available for delivery with the equipment in accordance with the contract schedule shall be depicted. The schedule shall indicate preparation time, in-process review time, validation time and final review time.".

Page 167: Immediately after the present paragraph 3.12.2.4, add the following paragraph:

"3.12.2.5 CD-2 Special Test Equipment Hardware Supplement Manual.- The contractor shall prepare and deliver a special test equipment hardware supplement to the Operation and Maintenance Technical Manual for the Autek Model 5810A Automatic Test System, publication number 465-0757 dated June 1982. The supplement shall describe the test hardware (3.6.3.1.2) and shall contain sections on 1) General Information and Requirements, 2) Technical Description, 3) Operation, 4) Standards and Tolerances, 5) Periodic Maintenance, 6) Maintenance Procedures, 7) Corrective Maintenance, 8) Parts List, 9) Installation, Integration, and Checkout, 10) Troubleshooting Support Data, 11) Computer Software. Only one level of theory discussion is required. At the contractor's option, the operator's supplement (3.12.3.2.3) may be integrated with this hardware supplement.".

Page 169, paragraph 3.12.3.1.2: Delete the first sentence, which begins "The contractor shall prepare...", and substitute therefor: "The contractor shall prepare and deliver an operator's manual for the input simulator (3.6.3.5) when it is a deliverable item."

In the second sentence, change "Each manual" to "The manual".

Page 169: Immediately after the present paragraph 3.12.3.1.2, add the following:

"3.12.3.1.3 CD -2 Supplement for the Autek 5810A Operation and Maintenance Manual.- The contractor shall prepare and deliver an operator's and maintenance manual to supplement the Operation and Maintenance Technical Manual for the Autek Model 5810A Automatic Test System, publication number 465-0757, dated July 1982. The supplement shall contain all information, direction and procedures neccesary to ensure that a repair technician familiar with the 5810A system can fully test the CD-2 assemblies identified in Table IX using the CD-2 special test programs and hardware provided (paragraph 3.6.3.1 herein). The supplement shall not repeat in large, wholesale fashion any of the material contained in either the 5810A technical manual or the other CD-2 documentation required herein. However, the manual shall, where clearly appropriate, include extracts of the material from these reference documents so that the test operator's transferring between documents during the course of fault detection and isolation is minimized.

The manual shall clearly indicate its relationship to other program documentation, identify procedures for updating the manual, describe the location and function of all operator controls, describe the use of all peripheral equipment, and provide detailed operating procedures. These procedures shall include a complete list of operator error halts, and initiation, intervention, and other actions permitted or required of the operator. It shall be bound separately from other related documentation, except that at the contractor's option it may be integrated with the special hardware supplement (3.12.2.5) and supplied as one document.".

Page 170, paragraph 3.12.3.3: Delete all of the present material under this paragraph heading and substitute the following therefor:

"3.12.3.3 Special Test Program Software Manual.- The contractor shall provide a CD-2 test program software manual that fully describes all deliverable test routines (3.8.3). This manual shall separately describe each test routine and its relationships to the Autek 5810A hardware and software, as well as to the hardware of the tested CD-2 assembly. The manual shall reference the Programmer's Manual/System Reference Manual for the Autek 5810A, Volume 1. The test program manual shall contain flowcharts, program listings and a narrative for each test program.

The test program software manual shall include but not be limited to the following:

(a) The manual shall specify the procedures for maintaining and updating the manual and identify the relationship of this manual to the other Autek and CD-2 software documents.

(b) The manual shall provide a detailed explanation of conventions adopted within the test programs with respect to flowcharting, table names, data names, routine labels, and calling sequences.

(c) The manual shall provide a detailed explanation of hardware-related programming factors such as input and output formats, code, bit arrangements for control characters, communication sequences, and both normal and error interrupt processing.

(d) The manual shall completely describe the changes, if any, to the 5810A's system software (3.8.3). This description shall cover definition, construction, use, nomenclature and limitations of each modified or new instruction or function.

(e) For each test program the manual shall provide a narrative description, specification of the program inputs, outputs and their definitions, a list of all flags, and the test method and algorithms used to test the CD-2 assembly. The contractor shall provide specifications in this section showing table definitions, storage allocation and identification of reserved registers. For each program, the contractor shall provide detailed flow charts as necessary to fully explain and describe the operation and flow of the test program.

(f) The manual shall provide for each test routine complete program listings, including step-by-step comments to describe the code.".

Page 171, paragraph 4.1: In the last two lines on page 171, change "any of the CD-2 systems and related circuit card assembly test sets (3.6.3.1) that are" to read: "any of the CD-2 systems and related special test programs and hardware (3.6.3.1) that are".

Page 175, paragraph 4.3.3.2: Under the Function column, change item (k) from "circuit card assembly tester performance" to read "performance of special test programs and hardware".

Page 176, paragraph 4.3.3.3: Insert the following paragraph between the end of paragraph 4.3.3.2 and the beginning of paragraph 4.3.3.3:

"4.3.3.2.1 Special Test Program Demonstration.- A formal demonstration of the special test programs for each tested assembly shall be conducted. It shall consist of inserting 5-ohm shorts to any power supply rail on at least 1% of the circuit nodes. The nodes to be shorted shall be randomly selected by an FAA representative during the demonstration. If the test comprehensiveness is not achieved during this demonstration, the number of induced faults shall be expanded to include a larger cross section of the nodes on the assemblies.".

Page 204: Immediately following page 204, insert the attached page 204/1.

Page 211: Delete the entire line that begins "3.6.3.1" and substitute the following therefor:

"3.6.3.1	Special test programs and hardware	137
3.6.3.1.1	Test programs	137
3.6.3.1.2	Test hardware	137".

Page 212: In the line that begins "3.8.3", change "Test programs" to "Special test programs".

Page 214: Immediately after the line that begins "3.12.2.4", add the following:

"3.12.2.5	CD-2 special test equipment hardware supplement manual	167".

Page 214: Immediately after the line that begins "3.12.3.1.2", add the following:

"3.12.3.1.3	CD-2 supplement for the Autek 5810A Operation and Maintenance Manual	169".

Page 214: In the line that begins "3.12.3.3", change "Test program user's manual" to "Special test program software manual".

Page 215: Immediately after the line that begins "4.3.3.2", add the following:

"4.3.3.2.1	Special test program demonstration	176".

Page 216: Immediately after the line that begins "Table VIII", add the following:

"Table IX	CD-2 assemblies tested with the Autek 5810A	204/1".

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STE (EN ROUTE)

WEATHER VIDEO COMPENSATOR
RANGE/AZIMUTH TIMING
TARGET PROCESSOR
CLUTTER PROCESSOR
WEATHER VIDEO INTEGRATOR
VIDEO QUANTIZER
A/D CONVERTER
WEATHER THRESHOLD PROCESSOR
SELF TEST

STE (TERMINAL)

WEATHER VIDEO COMPENSATOR
RANGE/AZIMUTH TIMING
TARGET PROCESSOR
CLUTTER PROCESSOR
WEATHER VIDEO INTEGRATOR
VIDEO QUANTIZER
A/D CONVERTER
WEATHER THRESHOLD PROCESSOR
SELF TEST

BTE

BEACON REPLY CONVERTER #1
BEACON REPLY CONVERTER #2
BEACON PROCESSOR #1
BEACON PROCESSOR #2
BEACON TEST TARGET GENERATOR
AMPLITUDE QUANTIZER
BOU/CORRELATOR
BTE TIMING

MC

PPI INPUT CONTROL (RAPPI)
COORDINATE CONVERTER
MEMORY CONTROL
PIXEL MEMORY
CONTROL PANEL PROCESSOR
MODEM RECEIVER
VIDEO MIXER
BUS CONTROLLER
PROGRAM STORE

CIM

CIM TTG #1
CIM TTG #2
AZIMUTH SELECTION
MODEM ADAPTER
STATUS AND ALARM
BUS CONTROLLER
STANDARD MICROPROCESSOR

MIG

AIMS PROCESSOR
HEIGHT PROCESSOR
RHI INTERFACE
PPI INTERFACE
MIG MODEM
DUAL BUS
RHI SHELF

OTHER

PRINTER (CIRCUIT CARD PORTION)
KEYBOARD
TRACKBALL

Table IX. CD-2 Assemblies Tested with the Autek 5810A